U.S. TRADE AND DEVELOPMENT AGENCY

EXECUTIVE SUMMARY

Feasibility Study for the Remediation of a Gold Mine and Iron Dressing Works, Korea

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Section 1
Introduction

The purpose of this project is to conduct a Feasibility Study (FS) on the remediation of an abandoned gold mine and ore processing facility in Korea. The primary objective of this FS is to determine the optimal technological and operational approach to remediate the contamination sources and contaminated media resulting from historical mining operations at the Imcheon site. The FS will be conducted in a phased approach that consists of three major tasks as described below.

Task 1. Assessment of Remediation Alternatives

The objective of Task 1 is to identify and evaluate remedial technologies and process options, and to develop remedial action alternatives that are applicable to the site. Existing environmental data and additional field data will be used to evaluate and develop a range of remedial action alternatives that also protect human health and the environment. This information will allow decision-makers to select the most appropriate remedial action or actions for the site.

Task 2. FS of Recommended Alternatives

The objective of Task 2 is to evaluate and select the remedial alternatives for detailed analysis. The work to be conducted under this task includes detailed analysis of the retained alternatives and preparation of the FS report of the recommended alternative.

Task 3. Development of Financial Plan

The objective of Task 3 is to develop a financial plan for selecting and implementing the recommended remedial alternative.

The overall- FS process for conducting Tasks 1 and 2 is illustrated by the flow diagram shown on Figure 1.1-1. This first report represents the first part of the FS process and contains the major components as described below:

Site Characterization and Development of Site Conceptual Models

Data regarding the physical characteristics of the site and the concentrations of potential contaminants of concern are gathered during site characterization activities that include taking measurements and sampling various contamination sources and contaminated media. Site characterization optimally results in development of a site conceptual model describing nature/extent of contamination, sources, transport pathways, contaminated media, exposure routes, and exposed populations at the site. The results of site characterizations conducted at the Imcheon site are provided in Section 1.2 of this report. Site conceptual models developed based on site characterization data (but which are also applicable to any historical mining site) are presented and discussed in Sections 1.4 and I.S.

APMRs Identification

Applicable or relevant/appropriate requirements (ARARs) are either (1) legally applicable government regulations that have been established to protect public health and the environment or (2) relevant and appropriate standards that address problems or situations sufficiently similar to those encountered at the site. ARARs are either chemical-specific, location-specific or action-specific. ARARs are usually identified concurrently with site characterization and are used in conjunction with site characterization data to develop preliminary remedial action objectives that are site-specific. ARARs for the Imcheon site (which are also applicable to any j
historical mining site in Korea) are presented in Section 1.6 of this report.

Identification of Preliminary Remediation Goals

In the United States, a baseline risk assessment (BRA) seeks to quantify the actual carcinogenic, noncarcinogenic and environmental risks posed by the site. In addition, the BRA includes (1) identification of contaminants of concern, (2) exposure assessment and (3) toxicity assessment. The objectives of exposure assessment are to identify and characterize potential exposure routes and receptors (potentially exposed populations) at the site, and to estimate expected exposure levels. Results of the BRA which evaluates exposures and associated risks are combined with the identified ARARs to develop preliminary remediation goals (PRGs) for the site. The PRGs are incorporated into remedial action objectives (RAOs) which address completed exposure pathways and are protective of human health and the environment. The generic conceptual exposure models presented and discussed in Sections 1.4 and 1.5 of this report are based on numerous exposure assessments conducted on historical mining sites in the United States. However, estimates of expected exposure levels (including those following various remedial actions) have not been made, as neither a BRA nor an evaluation of final acceptable exposure levels have been conducted for the site. Nevertheless, experience gained from numerous risk assessments conducted on historical mining sites in the United States has been used to develop the PRGs provided in Section 1.8 of this report.

Remedial Action Objectives

Remedial Action Objectives (RAOs) for the Imeheon site are provided in Section 1.8. These RAOs are expressed in terms of the contaminated medium of interest and PRGs based on ARARs and risk assessment results applicable to historical mining sites. The RAOs specify (1) the contaminant(s) of concern, (2) the exposure route(s) and receptors(s) and (3) an acceptable contaminant level or range of levels for each exposure route, i.e., a preliminary remediation goal.

General Response Actions

General response actions (GRAs) describe the medium-specific actions that will achieve the RAOs. GRAs for generic historical mining sites have been identified in this report and are presented in Section 1.8 along with the associated RAOs. The two media of interest at mining sites are solids (i.e. tailings, contaminated sediments, etc.) and water (both ground water and surface water).

Identification of Potential Technologies and Process Options

A number of different remedial technology types may comprise a particular GRA and, similarly, a number of different process options may comprise a particular technology type. The technologies and process options listed and described in Section 2 of this report represent a generic set for application to any historical mining site. These technologies and process options were identified based on experience with FSs conducted on mining sites in the United States.

Screening of Technologies and Process Options

The generic set of technologies and process options are screened based on technical feasibility, and relative effectiveness, implementability and cost. The screening evaluation is based on site-specific characteristics and professional judgment, with the intent of eliminating technologies/options that should not be evaluated further at the site versus retaining technologies/options that can then be used to develop a set of appropriate remedial action alternatives. The process options that are retained are generally selected to represent the various technology types for each medium of interest. Results of the technologies and process options screening are presented in Section 3 of this report.

Identification and Development of Remedial Action Alternatives

An appropriate set of remedial action alternatives are developed using the technologies and process options retained from the screening evaluation. In developing the alternatives, GRAs and the process options selected to represent the various technology types for each medium are combined to form alternatives for the site as a whole. Alternative development is based on FS experience on other mining sites in the United States and professional judgment. Remedial action alternatives developed for the Imicheon site are presented in Section 4 of this report.

The following sections of the FS process will be presented in a later report.

Additional Data Requirements

Additional site-specific data beyond that collected during initial site characterizations may be necessary in order to develop remedial action alternatives, proceed with detailed analysis of the selected alternatives and/or complete remedial designs. If so, such data needs must be filled by additional site characterization, which may also result in reevaluation of RAOs and GRAs, rescreening of potential technologies and process options, and redevelopment of remedial action alternatives. Typically, additional data requirements are limited to characterizations specific to evaluation or design of a particular process option and medium, such as determination of the acid generating capacity of mine waste rock. Additional characterization may also include treatability studies necessary to more fully develop, evaluate, and perform detailed analysis of remedial alternatives.

Screening of Alternatives

The set of remedial action alternatives are screened using the same criteria (effectiveness, implementability and cost) used to screen technologies and process options. The results of the screening is selection of a subset of alternatives to undergo detailed analysis.

Detailed Analysis of Selected Alternatives

The detailed analysis of selected alternatives consists of the analysis and presentation of the relevant information needed by decision-makers to (1) compare the alternatives and (2) select an appropriate remedy for the site. Evaluations and costing information are more detailed and accurate than during the screening evaluation described in the previous paragraph.

An additional goal of this FS is to provide a framework for evaluating other historical mining sites in Korea. Therefore, the procedure followed in generating this FS and the technologies and process options identified in this report are universal for any abandoned mine site in Korea. However, the screening of the technologies and process options, and the development of remedial action alternatives are specific to conditions at the Imcheon site.